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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/616,617	07/10/2003	Morris D. Stillabower	DP-309422	3345

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EXAMINER	
COOKE, COLLEEN P	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 03/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/616,617	STILLABOWER, MORRIS D.	
	Examiner	Art Unit	
	Colleen P Cooke	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 February 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/10/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Arguments

Applicant's arguments filed 2/10/05 have been fully considered but they are not persuasive.

Applicant argues that Pao et al. fails to teach a separation distance between the circuit board and surface mount device in the range of about 0.01 mm to 0.10 mm. However, as the applicant has pointed out and as was stated in the rejection, Pao et al. teaches that the size of the balls corresponds to the desired stand-off height between the component and circuit board, that they may be any diameter sufficient to achieve desired properties (Column 3, lines 16-18 and Column 5, lines 9-13 and 17-25), that factors such as coefficient of thermal expansion of the component (CTE) and circuit board directly influence what stand-off height is appropriate, and even further that the stand-off height is controlled so as to improve reliability and durability of the solder interconnection formed (Columns 3-4, lines 53-12). All of these teachings amount to teaching that the separation distance is a result-effective variable, which the applicant has not argued in any way; nor has the applicant addressed any argument to the examiner's position that under In re Boesch, 617 F.2nd 272, 205 USPQ 215 (CCPA 1980) the artisan thus would have been motivated to the choose an appropriate distance based on these result-effective teachings. Pao et al. gives an exemplary range of 0.127 mm to 0.5 mm but through all of the above teachings clearly contemplates other spacings may be appropriate dependent on the described factors.

Furthermore, the applicant has not provided persuasive argument that the applicant's claimed range, "about 0.01 mm to 0.10 mm" distinguishes over the specific teaching in Pao et al. which teaches a solder ball, and thus a corresponding separation distance, of 0.127 mm (Column

5, line 12). It is the examiner's position that not only does the teaching of the distance as a result-effective variable render the range obvious as described above, but additionally that the specific 0.127 mm teaching would appear to meet the applicant's claimed range of *about* 0.01 mm to 0.10 mm.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 7-16, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pao et al. (5931371).

With respect to claims 1, 3, 8, 9, 11-13, 15, 16 and 19, Pao et al. teaches an electronic package and method of making (see Figures 3 and 4) including bonding a device (24) with a contact terminal to a circuit board (14) having a mounting pad (16) and maintaining a standoff distance (20) between the device and the circuit by using a solder paste (12) with a plurality of solder balls (18), and reflowing by heating at a temperature to melt the solder paste but not the solder balls and wetting the bonding pad (Column 4, lines 13-22). Pao et al. teaches that the size of the balls corresponds to the desired stand-off height between the component and circuit board (Column 3, lines 16-18 and Column 5, lines 9-13 and 17-25), that factors such as coefficient of thermal expansion of the component (CTE) and circuit board directly influence what stand-off

height is appropriate, and further that the stand-off height is controlled so as to improve reliability and durability of the solder interconnection formed (Columns 3-4, lines 53-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to select a stand-off height of 0.01-0.10 mm or 0.01-0.03 mm, since it has been held that discovering an optimum value or a result effective variable involved only routine skill in the art. In re Boesch, 617 F.2nd 272, 205 USPQ 215 (CCPA 1980). The artisan would have been motivated to the choose an appropriate height by the reasoned explanation that the height is a function of the CTEs of the materials being joined and must be chosen so as to optimize the reliability and durability of the solder joint, as is all taught by Pao et al.

With respect to claims 2, 10, and 13, Pao et al. teaches that the amount of paste used should correspond to the volume of the desired solder interconnect minus the column of the solder balls (Column 3, lines 1-3) and that one or more solder balls may be used per joint (Column 3, lines 13-15).

With respect to claims 7 and 18, Pao et al. teaches that the stand-off members may be in a variety of shapes and are not limited to spheres (Column 5, lines 13-17) and further that even the spheres are made irregular during processing (Column 4, lines 41-48 and 62-65) by formation of dendrites (see also Figure 5).

Claims 4-6 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pao et al. (5931371) as applied to claims 1 and 12 above, and further in view of either Avery et al. (6340113) or Alcoe et al. (6631078).

Pao et al. teaches the electronic package and method of making as described with respect to claims 1 and 12 above. Although Pao et al. teaches that the solder balls (18) used to provide standoff distance between the electronic components may have a variety of shapes (Column 5, lines 13-15), Pao et al. does not specifically teach a hollow shape.

As both Avery et al. (Figure 1) and Alcoe et al. (Figure 2) teach in different embodiments, hollow metal particles (12 or 25 respectively) are used to provide standoff distance between electronic components (see Avery et al. Column 4, lines 37-41; see Alcoe et al. Column 4, lines 46-48). The solder particles used are metal and must have a higher melting point than a surrounding solder paste as taught by Pao et al. and described in reference to claim 8 above.

It would have been obvious to modify the teachings of Pao et al. by including metal particles for providing a standoff height and having a higher melting point than the solder which are of a hollow shape because Pao et al. teaches the particles may be any shape and Avery et al. and Alcoe et al. teach that the hollow shape is one known in the art for providing standoff height.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen P Cooke whose telephone number is 571-272-1170. She can normally be reached Mon.-Thurs. 8am-6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, her supervisor, Stan Silverman can be reached at 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Colleen P. Cooke

Colleen P Cooke
Examiner
Art Unit 1754